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ABSTRACT

In 1981, as part of its implementation of Roueche's model for developmental education, Pima Community College (PCC) initiated its first collegewide assessment and placement program. Faculty in the areas of reading, writing, and mathematics met to establish scores on which recommendations for student course placement would be based. A study was conducted to compare the teacher-recommended cutoff scores with minimum passing scores determined through the use of Dixon and Mood's stochastic approximation method. This model, termed the "Up-and-Down" method, permits the identification of a test score above which half of the examinees will be successful and below which the other half will be unsuccessful. In November 1981 and January 1982, 218 students were tested in reading, 108 in writing, and 44 in algebra. Based on data regarding students' test scores and course grades, the Dixon and Mood model was used to develop cutoff scores. A crosstabulation of cutoff scores and grades revealed the model to be 61% accurate in predicting student success in reading and 62% successful with mathematics students. The teacher-judgement and stochastic procedures yielded different cutoff scores for student placement. The study report includes a discussion of the implementation of the Roueche model at PCC, focusing on its ease of application and clear emphasis on the teacher as the key to success. (Author/LL)

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IDENTIFICATION AND PLACEMENT OF COLLEGE STUDENTS IN DEVELOPMENTAL EDUCATION PROGRAMS

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A B S T R A C T

The present research is twofold: 1) an examination of Roueche's model which provided the background for the present research and 2) a contrast of two methods for setting cutoff scores: a) the a priori judgmental method, and b) a stochastic approximation procedure which estimates the true minimum passing score. Roueche's model of developmental education was implemented at Pima Community College in 1981. Implementation of a comprehensive developmental education program began in the spring of 1982. Incoming students at one of Pima Community College's campuses were assessed in reading, writing, and mathematics in November 1981 and January 1982. Judgmental and stochastic processes were compared, as well as the examination of the implementation of Roueche's model. The findings of this research are: 1) The Roueche model could be implemented with few problems because a) its relative simplicity, b) its ease of application, and c) its clear emphasis on the teacher as the key to success; 2) The judgmental and stochastic procedures yielded different cutoff scores. Although the judgmental method has face validity, the stochastic procedure yields valuable alternative information. The Roueche model should be considered when planning Developmental Education programs, and alternative standard setting procedures should be used more when setting cutoff scores.

IDENTIFICATION AND PLACEMENT OF COLLEGE STUDENTS IN DEVELOPMENTAL EDUCATION PROGRAMS[1]

Community college counselors, instructors, and administrators are faced with providing coping skills to an ever-increasing number of students who have not been adequately prepared by our education system over the last fifteen to twenty years (Boyer and Hechinger, 1981). Adult education statistics indicate that 90 percent of incoming community college students have verbal deficiencies (Roueche, 1980). Of these, more than 50 percent are reading below the eighth grade level (Roueche, 1980). For those students reading below the eleventh grade level, the attrition rate is staggering. Indeed, the most cited reason for dropping college courses is inadequate preparation (Sheldon and Hunter, 1980).

The role of a community college as the vehicle for adult literacy development is receiving increased national attention. In particular, the establishment of a comprehensive developmental education program firmly based on a holistic

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perspective has become the single, most significant support service program for the non-traditional student. Students who participate in developmental education programs exhibit many positive characteristics; one is higher persistence rates (Friedlander, 1981). Through these programs, adults are developing the sophisticated vocabulary and numerous writing and computational skills needed to function in an urban environment (Negin and Krugler, 1980). Even those who criticize developmental education believe that the community college's major strength will be in adult literacy development through the 1980's (Cohen, 1982).

ROUECHE'S MODEL

Some community colleges have implemented their developmental education programs following Roueche's model (Roueche and Snow, 1977; Rouche, 1980), and have documented student success rates in open door institutions. Pima Community College has also begun to implement the elements in Roueche's model of holistic literacy- "the student's learning style, the teacher's choice of content and teaching methods, and the kind of learning environment" (Roueche, 1980, p. 9). Roueche (1980) reported, however, that within his holistic model of developmental education certain specific requirements are implied:

> ...credit for remediation courses; teachers who want to teach in such a program; preservice and inservice training for faculy and counseling staff, including sensory approaches... and counseling techniques; a separate division with strong administrative support; careful coordination with the parent institution of recruitment, preassessment, counseling, and placement; a special organizational structure; and ongoing evaluation, follow-up, change, and improvement. (p. 49)

Roueche (1980) argued that a student must have adequate verbal and quantitative skills to succeed in almost all courses at the community college level. Further, he reported that "colleges must begin serious preassessment of student entry-level skills when students come to the college campus." Preassessment conducted before enrollment in courses is defined by Roueche as "the diagnostic process of determining through a streamlined one-to two-hour examination the nature and circumstances of the student's educative condition" (Roueche, 1980, p. 52). Among the various testing instruments available for pre-assessment, Roueche recommends a reading test, a tool to determine locus of control, and study skills as well as career interest inventories. Previous research (for example, Douglas and Powers, 1982) have found locus of control correlated with personality dimesions and expectancy of success. Through these various assessment activities, students will be afforded the opportunity to learn basic skills vital to college success. These skills, then, will aid the student to gain self-confidence in cognitive and affective abilities and to progress successfully toward educational and career goals.

Because Pima Community College did not originally establish a clearly discernible division or department of developmental studies, in 1980 a college-wide Developmental Education Committee was formed to study the role and scope of developmental education activities within the College's curriculum. The role of this committee was then expanded in the fall of 1981 to include the review and recommendation of appropriate policies and the coordination of all activities concerning developmental education throughout the College. As a result of the tasks undertaken by this district committee during the 1981-82 academic year, a number of major tasks were accomplished: (1) a Developmental Education Policy was recommended to the Board of Governors for adoption, (2) the first uniform, college-wide assessment and placement program was initiated and completed, (3) the first student profile in reading, writing, and mathematics was completed, and (4) a survey of developmental education opportunities within the College was completed.

Although voluntary assessment activities have been offered in varying degrees at Pima Community College, the testing programs lacked uniform assessment instruments. Indeed, in a review of literature, Powers and Crowder (1982) reported evidence that many nationally-known test batteries failed to measure reading or other skills as clearly defined domains. Thus, there were many inconsistencies among the

testing procedures at Pima Community College's four campuses. One major task of the Developmental Education Committee was to coordinate the efforts of the faculty in the setting of cutoff scores. The purpose of the recent study is (1) to compare the cutoff scores obtained by the reading, writing, and mathematics faculties using a judgmental method, and the stochastic approximation technique, and (2) to try out a new method of setting cutoff scores.

METHOD

Pima Community College (PCC) is a large urban community college district with an unduplicated headcount enrollment in the fall of 1981 of 20,400 students (5,604 full-time and 14,796 part-time students). PCC serves the residents of Pima and Santa Cruz Counties (over 3,400 square miles) with three campuses within Tucson-the West Campus, the East Campus, and the Downtown Campus and one campus, the Community Campus, offering classes in over 60 locations as a "campus without walls." The ethnic composition of the College in the fall of 1981 was American Indian, 2%; Black, 4%; Asian, 2%; Hispanic, 18%, and White (non-Hispanic), 74%.

Sample

A total of 298 incoming students were tested during November 23-25, 1981 and January 7-13, 1982 at the PCC Downtown Campus in reading (N=218), writing (N=108), and mathematics (N=208).

Instruments

The Nelson-Denny Reading Test, Form A, consists of four tests: Vocabulary (100 items), Comprehension (36 items), Total Reading (136 items), and Rate. For the Comprehension score, the total number correct is doubled giving a score range from 2-72. Split-half reliabilities were reported by the authors of the Nelson-Denny of .93 for Vocabulary, .81 for Comprehension, and .92 for Total Reading.

The PCC Mathematics Test was a faculty-developed test consisting of an Arithmetic Test (20 items) and an Algebra Test (24 items). Only students demonstrating an adequate level of arithmetic skill were allowed to take the Algebra Test. The Kuder-Richardson (KR21) reliability for the Arithmetic Test was .81.

The PCC Writing Test was a holistically scored paragraph which was evaluated by two trained scorers. Scores were assigned from (1) poor to (6) excellent. The two scores were added together to obtain a total score which ranged from 2 to 12. The KR21 reliability for the PCC Writing Test was .57.

Procedures

In the fall of 1981 PCC faculty in the subject areas of reading, writing, and mathematics met to establish scores on which would be based recommendations for student course placement. Cutoff scores were established in reading after referring to the norms tables, the grade equivalents, the test items, the reading difficulty of the items, and the faculty's professional judgment of the level needed for optimal achievement in reading. The mathematics faculty developed their own test and set cutoff scores based on the mathematical skills expected as prerequisite to each mathematics course. The writing faculty based their cutoff scores on the writing skills which should be expected from an incoming student in writing.

A problem often faced within educational research is the setting of cutoff scores (or passing scores) on a written test. Cutoff scores separate successful or unsuccessful examinees (or qualified or unqualified). Such a decision often involves a written test score and a criterion measure (successful/unsuccessful) or a judgment. A cutoff score is a standard based on judgments. Glass (1978) asserted that standards are arbitrary or are built on arbitrary premises. Popham (1978) pointed out that although standards may be arbitrary, they may be reasonable and defensible. Shephard (1980) added that standard setting approaches are all techniques for gathering information and drawing attention to the choices to be made.

Livingston and Zieky (1982) have recently presented many of the methods for setting passing scores. They have divided these methods into three categories: (1) Methods Based on Judgments About Test Questions: (A) the Nedelsky Method, (B) the Angoff Method, (C) the Ebel Method; (2) Methods Based on Judgments About Individual Test-Takers: (A) The Boarderline-Group Method, (B) the Contrasting-Groups Method, (C) The Up-and-Down Method; and (3) Methods Based on Judgments About a Group of Test-Takers. For a clear explanation of each one of these methods, see Passing Scores by Livingston and Zieky (1982).

Stochastic Approximation Technique

Only recently have stochastic approximation techniques appeared with applications to problems in educational and psychological testing. Livingston (1980) described several stochastic approximation techniques which could be applied to testing problems. The present study will apply the Dixon and Mood (1948;Livingston, 1980) "Up-and-Down Method."

The particular situation in which this method is appropriate is when a researcher would like to establish a cutoff score on a written test such that it classifies students as successful or unsuccessful (qualified/unqualified). Consider the situation where students have been administered a written test. To determine if the student is successful or not, it is necessary to administer a performance measure which is either expensive or time consuming. The researcher wants to concentrate on the area of the test score range in which one-half of the examinees are successful and one-half are unsuccessful. The researcher wants to obtain a cutoff score on the written test but faces certain problems: (1) Everyone cannot be tested because the performance measure is expensive or time consuming, and (2) it is not certain on which part of the test score scale to focus since the performance measures have not yet been obtained.

In order to apply Dixon and Mood's (1948) Up-and-Down Method, it is assumed (1) the examinees were administered the written test before the judgments of their skills were obtained, and (2) the examinees are selected for judgment one at a time.

Dixon and Mood Method:

1. Select an examinee with a written test score near where you think the proper cutoff score might be.
2. If the first examinee was judged to be qualified, choose next an examinee one step below the first. If the first examinee was judged to be unqualified, choose next an examinee with one step above the first. Obtain a judgment of the second examinee's skills.
3. Repeat Step 2. Select the third examinee on the basis of the judgment of the second examinee.

To calculate the cutoff score, Livingston (1980, p. 863) states "If there have been more successes than failures, take the mean written test score of all persons who failed the performance measure and add half the stepsize. If there have been more failures than successes, take the mean written test score for those persons who succeeded on the performance measure and subtract half the stepsize. The purpose, then, of the Up-and-Down Method is to estimate the true minimum passing score with $p = .50$. For the situation where it is desired that $p \neq .50$, see Livingston (1980) or Whetherill and Levitt (1965) for an application of the up-and-down transformed rule.

RESULTS AND DISCUSSION

Results of testing students in reading (N=218), writing (N=108), arithmetic (N=208) and algebra (N=44) are presented in Table 1. Students score higher in Vocabulary relative to national norms (44th percentile) than in Comprehension (20th percentile). The Reading Rate score was actually above the average of the norm group (57th percentile). Norm-referenced comparisons of writing, arithmetic, and algebra could not be made because these were faculty-developed tests.

Insert Table 1 about here

Of the 218 tested in reading, 68 (31%) actually enrolled in a reading class; 108 were tested in writing and 69 (64%) enrolled in a writing class; 208 were tested in mathematics and 121 (58%) enrolled in mathematics classes. In a follow-up study of these same students, the number of dropouts were recorded. Of those who were tested and who enrolled in reading, 19 (28%) dropped the class; in writing 33 (48%) dropped out; and in mathematics, 31 (26%) dropped out.

The Dixon and Mood (1948) method was used with the 66 students who had test scores on the Comprehension Test and who had received grades on completion of the reading course in which they enrolled. Grades were given on a scale from (4) A to (2) C.

The Comprehension scores ranged from 2 to 72. Since 30 seemed like the lower range of the true minimum passing score, the Dixon and Mood (1948) procedure began with 30. Following this procedure, the written test score was observed. If the student was below a 4 (A), then the student was unsuccessful (U). If the final grade was a 4, the student was judged successful. After each written test score step, it was observed whether the student was successful or not. The cutoff score obtained by this method was 37.2. This could be compared with the mean of all tested students (N=218) which was 34.0. The Dixon and Mood results are graphed in Figure 1.

Insert Figure 1 about here

The Dixon and Mood (1948) method was applied to the PCC Arithmetic Test scores using grade as the criterion measure. The purpose was to obtain a cutoff score between the highly successful student (4) and the other students. The Arithmetic Test scores ranged from 1-20. The cutoff score was obtained as before in the step-by-step manner. The cutoff score obtained was 16.2. This could be compared with the arithmetic mean score for the total tested (N=208) which was 13.9. Refer to Figure 2 for a graph of the results.

Insert Figure 2 about here

One measure of the degree of precision is a crosstabulation of those above or below the cutoff and successful/unsuccessful grade (i.e., 4 vs. a lower grade). For example, with the Comprehension scores, the number who were unsuccessful who scored below the cutoff was 25. The number who were successful and scored above the cutoff was 15. These two numbers represent successful predictions. That is, 61% were successful predictions utilizing the cutoff scores, and 39% were unsuccessful predictions. With the mathematics test, utilizing the cutoff score, 62% were successful predictions and 38% were not. Refer to Table 2 for a summary of those predictions which were successful and unsuccessful.

Insert Table 2 about here

The cutoff scores for reading (37.2) and for mathematics (16.2) which were used to predict highly successful students from the others on the basis of the end of the semester grades can be compared with the actual cutoff scores employed to recommend students to various reading and mathematics classes. Refer to Table 3.

Insert Table 3 about here

The reading cutoff score fell in the middle of the "Recommended" category of reading. This agrees somewhat with the faculty recommendations. The mathematics cutoff score was within the range of scores in which students were recommended

for Algebra 1 or higher.

The Dixon and Mood (1948) procedure is useful under the special conditions outlined by Livingston; i.e., when performance measures are expensive or limited. The present study was an investigation of the Dixon and Mood method (1948) utilizing results of a small sample in a community college. The results could be generalized to setting cutoff scores in other areas of the test score scale. However, this method demonstrates only one approach to setting cutoff scores. Other approaches are mentioned earlier in this paper.

The purpose of this paper has been to examine Rouche's model for implementation of developmental education on community colleges. The manner in which this model has been carried out at Pima Community College has resulted in significant steps in the providing to students additional support in their academic studies. The stochastic approximation technique of Dixon and Mood (1948) is only one approach to setting cutoff scores. As developmental education expands on community college campuses, the faculty and administration can turn to a variety of methods to establish cutoff scores.

TABLE 1. Means and Standard Deviations For the PCC Testing In Reading, Writing And Mathematics

Test	N	M	SD	Percentile	GE
Vocabulary	218	32.2	16.8	44	12.7
Comprehension	218	34.0	13.5	20	11.1
TOTAL	218	66.0	28.6	37	12.3
Rate	218	242.0	100.6	57	12.4
Writing	108	6.6	2.5	*	*
Arithmetic	208	13.9	4.3	*	*
Algebra	44	12.0	3.5	*	*

*These tests are not norm-referenced tests, and therefore, they do not have percentiles and Grade Equivalents (GEs).

TABLE 2. Crosstabulation Of Those Above and Below and Mathematics Cutoff Scores and Successful/Unsuccessful Performance Measure

Test	Performance Measure		Total
	Successful	Unsuccessful	
ND Comprehension[1]			
Above Cutoff	15	17	32
Below Cutoff	9	25	34
Total	24	42	66
Mathematics[2]			
Above Cutoff	12	8	20
Below Cutoff	17	28	45
Total	29	36	65

[1] In reading, 61% successful predictions; 39% unsuccessful.

[2] In mathematics, 62% successful predictions; 38% unsuccessful.

TABLE 3. Cutoff Scores And Recommendations

Recommendation	Test	Score Interval
Reading Recommendations		
Strongly Recommended	Comprehension	0-20
Highly Recommended	Comprehension	22-32
Recommended	Comprehension	34-42
Optional	Comprehension	44-Above
Writing Recommendations		
Writing 70	Comprehension + Writing	0-20 2-8
Writing 100	Comprehension + Writing	22-32 5-12
Writing 101	Comprehension + Writing	34-42 9-12
Mathematics Recommendations		
Math 60A	Arithmetic	0-7
Math 60	Arithmetic	8-13
Math 70, MTH 110 or BUS 51	Arithmetic	14-20
Math 130	Arithmetic + Algebra	70% Correct 14 or higher

Note: Writing 70 (Developmental Writing), Writing 100 (Writing Fundamental), Writing 101 (Writing); Math 60A (Introductory Math - Whole Numbers), Math 60 (Introductory Math), Math 70 (Algebra I), Math 130 (Algebra II).

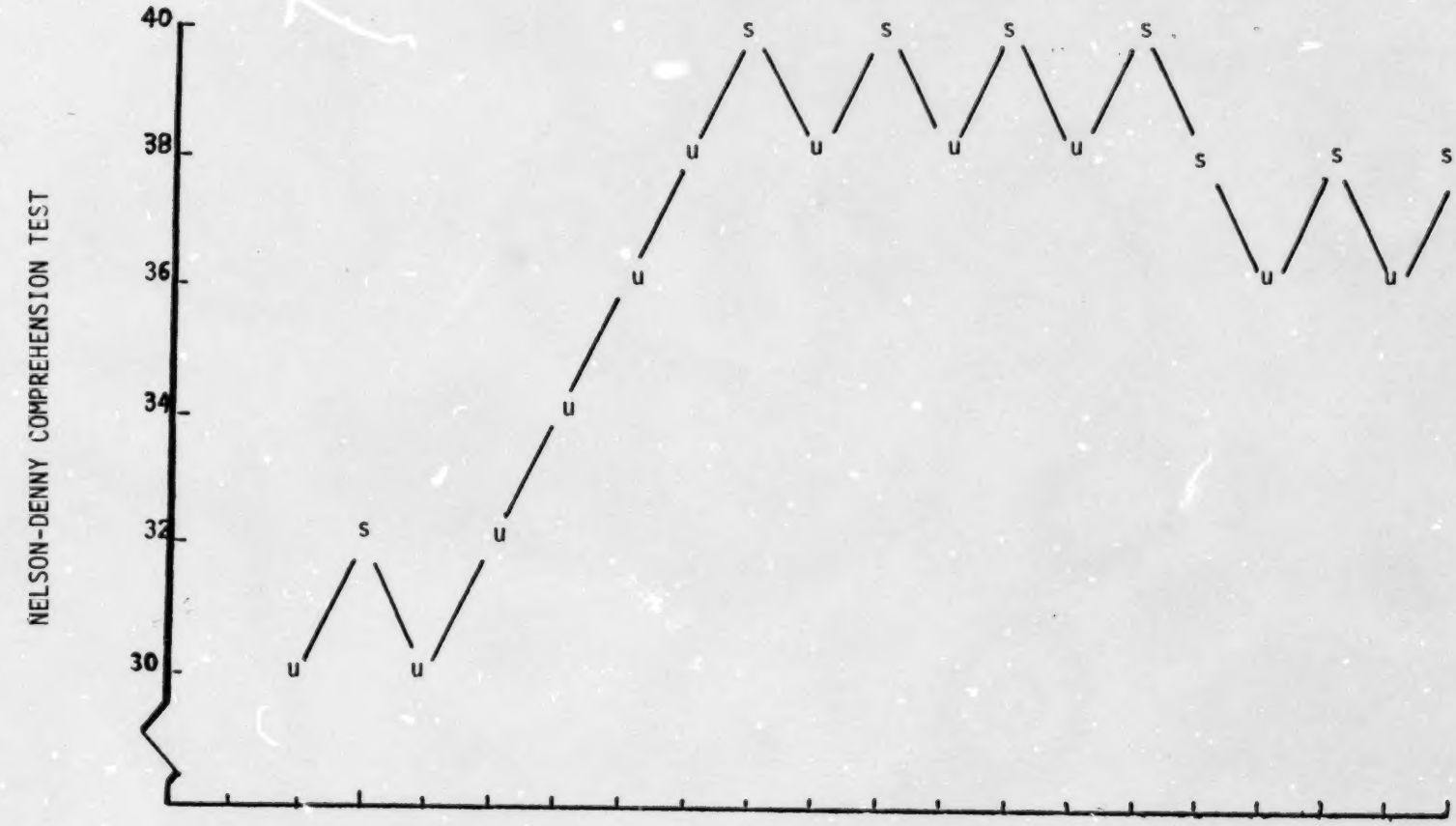

FIGURE 1. NELSON-DENNY COMPREHENSION TEST
vs
UNSUCCESSFUL/SUCCESSFUL ON FINAL GRADE

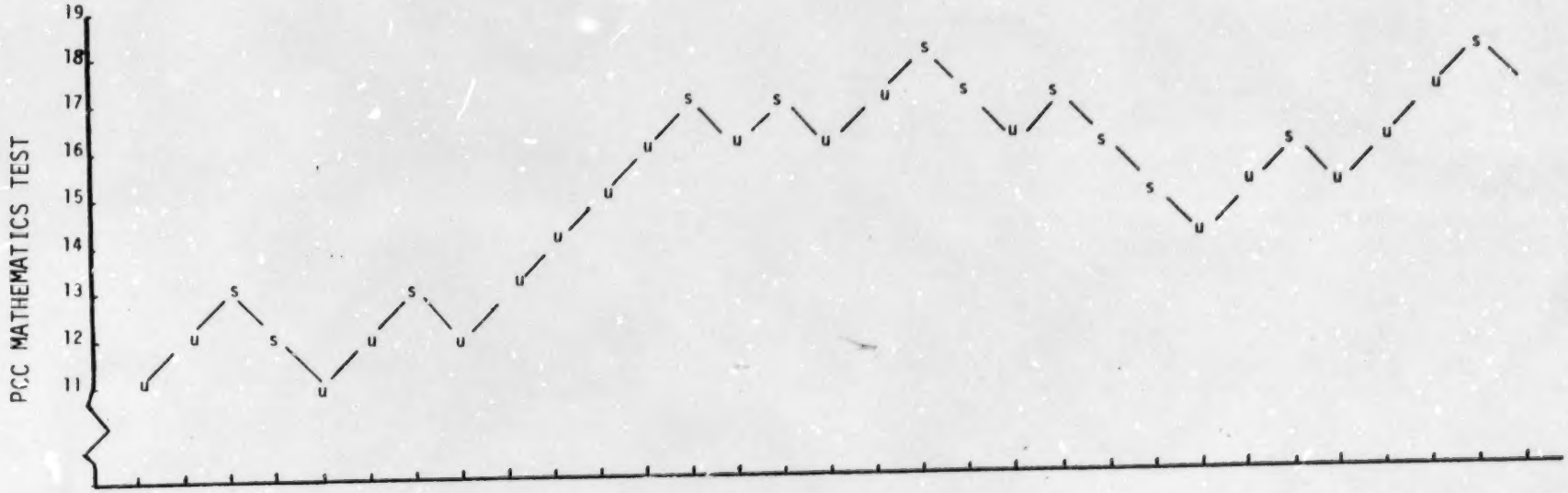

FIGURE 2. PCC MATHEMATICS TEST
vs
UNSUCCESSFUL/SUCCESSFUL ON FINAL GRADE

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REFERENCES

Boyer, E. L., and Hechinger, F. Higher Learning In The Nation's Service. Washington, D. C.: The Carnegie Foundation For The Advancement Of Teaching, 1981.

Cohen, A. M. "Ten Criticisms of Developmental Education." Junior College Resource Review. Los Angeles: ERIC Clearinghouse For Junior Colleges, Spring 1982.

Dixon, W. J. and Mood, A.M. "A Method For Obtaining And Analyzing Sensitivity Data." Journal Of The American Statistical Association, 1948, 43, 109-126.

Douglas, P. and Powers, S. "Relationship Of Academic Locus of Control And Expectancy Of Success Among Academically Gifted Students." Psychological Reports, 1982, in press.

Friedlander, J. "Why Students Drop Courses." Junior College Resource Review: ERIC Clearinghouse For Junior Colleges, 1981. ERIC Report: ED 196 505.

Glass, G. V. "Standards and Criteria." Journal Of Educational Measurement, 1978, 15, 237-261.

Livingston, S. A. "Choosing Minimum Passing Scores By Stochastic Approximation Techniques." Educational and Psychological Measurement, 1980, 40 859-873.

Livingston, S. A. and Zieky, M. J. Passing Scores: A Manual For Setting Standards Of Performance On Educational And Occupational Tests. Princeton: Educational Testing Service, 1982.

Negin, G. A. and Krugler, D. "Essential Literacy Skills For Functioning In An Urban Community." Journal of Reading, 1980, 109-115.

Popham, W. J. "As Always Provocative." Journal Of Educational Measurement, 1978, 15, 297-300.

Powers, S. and Crowder, C. "Redundancy Of The California Achievement Test." Educational And Psychological Measurement, 1982, 42, 1121-1124.

Roueche, J. E. and Mink, O. G. Holistic Literacy In College Teaching. New York: Media Systems Corporation, 1980.

Roueche, J. E. and Snow, J. J. Overcoming Learning Problems. San Francisco: Jossey - Bass, 1977.

Sheldon, M. S. and Hunter, R. Statewide Longitudinal Study Report On Academic Year 1978-79. Part II: Spring Results. Woodland Hills, California: Pierce College, 1980. ERIC Reports: ED 184 636.

Shepard, L. "Standard Setting Issues and Methods." Applied Psychological Measurement, 1980, 4, 447-467.

Wetherill, G. B. and Levitt, H. "Sequential Estimation of Points On A Psychometric Function." British Journal Of Mathematical and Statistical Psychology, 1965, 18, 1-10.

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